

①

$$\begin{aligned} \textcircled{2} \quad 2x + y &= 3 & (A) \\ 3x + 2y &= 1 \end{aligned}$$

(4) 3×2 (5) $\begin{bmatrix} 2 & 3 & 4 \\ -3 & -4 & 5 \end{bmatrix}$

$$\frac{1}{3}R_2 \left[\begin{array}{ccc|c} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 2 & -1 & 1 & 6 \end{array} \right] \xrightarrow{-2R_1 + R_3} \left[\begin{array}{ccc|c} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 0 & -3 & 3 & 12 \end{array} \right] \xrightarrow{\frac{1}{3}R_3} \left[\begin{array}{ccc|c} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 0 & -1 & 1 & 4 \end{array} \right]$$

$$R_2 + R_3 \quad \left[\begin{array}{ccc|c} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{array} \right] \quad \begin{array}{l} z = 3 \\ y = -1 \end{array} \quad \begin{array}{l} x + y - z = -3 \\ x - 1 - 3 = -3 \\ x - 4 = -3 \end{array} \quad (1, -1, 3)$$

⑦

$$\begin{aligned} ① \quad & x + 3y + z = 3 \\ ② \quad & x + 5y + 5z = 1 \\ ③ \quad & 2x + 6y + 3z = 8 \end{aligned}$$

$$\begin{aligned} x + 3y + z &= 3 \\ x + 3(-5) + z &= 3 \\ x - 15 + z &= 3 \end{aligned}$$

$$x - 13 = 3$$

$$\boxed{x = 16}$$

1+2 eliminate x

$$\begin{aligned} -1(x + 3y + z = 3) & \quad -x - 3y - z = -3 \\ x + 5y + 5z = 1 & \quad x + 5y + 5z = 1 \end{aligned}$$

$$2y + 4z = -2 \quad ④$$

1+3 eliminate x

$$\begin{aligned} -2(x + 3y + z = 3) & \quad -2x - 6y - 2z = -6 \\ 2x + 6y + 3z = 8 & \quad 2x + 6y + 3z = 8 \end{aligned}$$

$$\boxed{z = 2}$$

$$2y + 4z = -2$$

$$2y + 4(2) = -2$$

$$2y + 8 = -2$$

$$2y = -10$$

$$\boxed{y = -5}$$

$$\boxed{(16, -5, 2)}$$

(3)

$$\textcircled{3} \quad x - 3z = -2$$

$$3x + y - 2z = 5$$

$$2x + 2y + z = 4$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 3 & 1 & -2 & 5 \\ 2 & 2 & 1 & 4 \end{array} \right] \begin{array}{l} -3R_1 + R_2 \\ -3R_1, [-3 \ 0 \ 9 \ 6] \end{array} \quad \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 2 & 2 & 1 & 4 \end{array} \right]$$

$$\begin{array}{l} -2R_1 + R_3 \\ -2R_1, [-2 \ 0 \ 6 \ 4] \end{array} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 2 & 7 & 8 \end{array} \right] \begin{array}{l} -2R_2 + R_3 \\ -2R_2, [0 \ -2 \ -14 \ -22] \end{array} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & -7 & -14 \end{array} \right] \begin{array}{l} \frac{1}{7}R_3 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & 1 & 2 \end{array} \right]$$

$$\boxed{z = 2}$$

$$y + 7z = 11$$

$$y + 7(2) = 11$$

$$y + 14 = 11$$

$$\boxed{y = -3}$$

$$\boxed{(4, -3, 2)}$$

$$x - 3z = -2$$

$$x - 3(2) = -2$$

$$x - 6 = -2$$

$$\boxed{x = 4}$$

(4)

$$\begin{aligned} \textcircled{9} \quad x - 2y + 3z &= 9 \\ -x + 3y &= -4 \\ 2x - 5y + 5z &= 17 \end{aligned}$$

3x in Equation (1) should be 3z

If you answered question as is:

$$x = -4/75 \quad y = 59/150 \quad z = -121/50$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ -1 & 3 & 0 & -4 \\ 2 & -5 & 5 & 17 \end{array} \right] \xrightarrow{R_1+R_2} \left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 2 & -5 & 5 & 17 \end{array} \right]$$

$$\begin{aligned} &-2R_1 + R_3 \\ -2R_1 &\left[\begin{array}{ccc|c} -2 & 4 & -6 & -18 \end{array} \right] \quad \left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & -1 & -1 & -1 \end{array} \right] \xrightarrow{R_2+R_3} \end{aligned}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 2 & 4 \end{array} \right] \xrightarrow{\frac{1}{2}R_3} \left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 1 & 2 \end{array} \right]$$

$$\boxed{z = 2}$$

$$\begin{aligned} y + 3z &= 5 \\ y + 3(2) &= 5 \\ y + 6 &= 5 \\ \boxed{y} &= -1 \end{aligned}$$

$$\begin{aligned} x - 2y + 3z &= 9 \\ x - 2(-1) + 3(2) &= 9 \\ x + 2 + 6 &= 9 \\ x + 8 &= 9 \\ \boxed{x} &= 1 \end{aligned}$$

$$\boxed{(1, -1, 2)}$$

(5)

(10)

$$(a) \begin{array}{l} 7x - 2y = 14 \\ -3y + 7x = 21 \end{array} \rightarrow \begin{array}{l} 7x - 2y = 14 \\ -1(7x - 3y = 21) \end{array} \quad \begin{array}{l} 7x - 2y = 14 \\ -7x + 3y = -21 \end{array}$$

$$y = -7$$

$$7x - 2y = 14$$

$$7x - 2(-7) = 14$$

$$7x + 14 = 14$$

$$7x = 0$$

$$x = 0$$

$$(0, -7)$$

$$(b) \begin{array}{l} -4x + 5y = 14 \\ 4x - 3y = -8 \end{array}$$

$$2y = 6$$

$$y = 3$$

$$-4x + 5y = 14$$

$$-4x + 5(3) = 14$$

$$-4x + 15 = 14$$

$$-4x = -1$$

$$x = 1/4$$

$$(1/4, 3)$$

$$(c) -a - 4b = -93$$

$$a + 4b = 43$$

$$0 = -50$$

no solution

$$(d) \begin{cases} 8x + 12y = 48 \\ 6x + 9y = 36 \end{cases}$$

$$-1(6x + 9y = 36)$$

$$24x + 36y = 144$$

$$-24x - 36y = -144$$

$$0 = 0$$

infinite solutions

$$(e) \begin{array}{l} 4x - 5y = -6 \\ -4(x - 3y) = 2 \end{array}$$

$$\begin{array}{l} 4x - 5y = -6 \\ -4x + 12y = -8 \\ \hline 7y = -14 \\ y = -2 \end{array}$$

$$\begin{array}{l} 4x - 5y = -6 \\ 4x - 5(-2) = -6 \\ 4x + 10 = -6 \quad | \quad (-4, -2) \\ 4x = -16 \\ x = -4 \end{array}$$

11)

$$(a) \quad G = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 3 & 1 & -1 & 2 \\ 2 & 3 & 2 & 7 \end{array} \right] \quad \begin{array}{l} -3R_1 + R_2 \\ -3R_1 + R_3 \end{array} \quad [-3 \ 6 \ -3 \ -21]$$

$$(b) \quad H = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & -4 & -19 \\ 2 & 3 & 2 & 7 \end{array} \right]$$

$$\begin{array}{l} -2R_1 + R_3 \\ -2R_1 \\ [-2 \ 4 \ -2 \ -14] \end{array} \quad (c) \quad J = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & -4 & -19 \\ 0 & 7 & 0 & -7 \end{array} \right] \quad \begin{array}{l} -R_2 + R_3 \\ -R_2 \\ [0 \ -7 \ 4 \ 19] \end{array} \quad (d) \quad K = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & -4 & -19 \\ 0 & 0 & 4 & 12 \end{array} \right]$$

$$(e) \quad L = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & 0 & -7 \\ 0 & 0 & 4 & 12 \end{array} \right] \quad (f) \quad \frac{1}{7}R_2 \quad P = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 4 & 12 \end{array} \right]$$

$$(g) \quad \frac{1}{4}R_3 \quad Q = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{array} \right]$$

$$(h) \quad \begin{array}{l} z = 3 \\ y = -1 \end{array} \quad \boxed{(2, -1, 3)}$$

$$x - 2y + z = 7$$

$$x - 2(-1) + 3 = 7$$

$$x + 2 + 3 = 7$$

$$x + 5 = 7$$

$$x = 2$$